

reflection will disclose the fallacy of such a criterion. If the problem of colonial administration could be satisfactorily solved by imitating ancestral patterns, what is the reason for the frequent failure of nations which systematically follow this course? why should it be thought necessary to utter warnings against the attempt to import Berlin into Uganda? and how is the success which attends the experimental and empirical methods of Great Britain to be explained?

Readers of NATURE are aware that evolution depends on the power of adaptation to environment, and will have no difficulty in recognising that the secret of the British Empire lies in the plasticity which permits the free play of variation, so as to fit novel functions to new requirements. A perusal of Prof. Gregory's book will disclose numerous experiments in social and industrial legislation which have been made to meet Australian conditions; and his appreciation of many of these departures presents an interesting contrast to the indiscriminating denunciations of most British observers. The volume is a compendium of geography; but the geography of to-day is a much wider subject than the dry-bone catalogues which formerly stood for that science, and which were so repulsive to students of the previous generation. Under the heading of Physical, Economic, and Political Geography, the author has succeeded in presenting a life-like picture of the countries he describes.

Isolation, according to Prof. Gregory, is the explanation of the physical, biological, and political features of Australasia. The strange forms of fauna in Australia are due to its long separation from other continents. The unique aspect of its vegetation is similarly due to development in what is happily called "a biological backwater"; but it is a mistake on that account to regard the flora as primitive in character; it is in reality highly specialised, and the author quotes with approval Spencer Moore's statement that in adaptation of plant life to a dry climate "the Australian flora is without a parallel the world over." It is also a common error to regard the Australian aborigines as archaic. They are closely allied to the hill tribes of Southern India; and here, again, the evidence of specialisation is abundant. The social system of the aborigines is elaborate, and on their own plane they have attained a fair degree of civilisation. Their mental capacity is considerable, and their disposition is described as "kindly, peaceful, and amiable." They are possessed of poetical imagination, and have an intense belief in the immanence of the spiritual world.

Prof. Gregory regards the prevailing aspect of Australian scenery as hopefulness, and this quality is reflected in the temperament of the inhabitants. Although Australians are happy in their dispositions, they are accustomed to make some present sacrifice of comfort for the sake of the future. This has been repeatedly shown by the labour party, to whose efforts advanced temperance legislation is largely due. Although, as a conservative in British politics, Prof. Gregory went to Australia with the "bogey" idea of the Australian Labour Party, he sees much to

admire in their ideals. His observations on the White Australia policy show both sympathy and discernment. He remarks that "no nation has yet become great which left aliens to do its manual labour." Labour in Australia, though high-priced, is cheap because it is so efficient; dividends are paid out of deep quartz mines producing 2 dwts. of gold to the ton, and Australia holds the record of cheap and rapid deep-shaft sinking. The arguments for an Australian navy are fairly stated, as also are those for the Alien Immigration Acts. The chapters on the exploration and discovery of Australia are full of interest, and there is a concise description of Australian federation. Prof. Gregory's volume will well repay perusal, and is a welcome addition to descriptive works on Australasia.

JOHN A. COCKBURN.

AIR CURRENTS AND VENTILATION.

Air Currents and the Laws of Ventilation. By Dr. W. N. Shaw, F.R.S. Pp. xii+94. (Cambridge: University Press, 1907.) Price 3s. net.

THIS book contains the substance of a course of lectures delivered by Dr. Shaw at Cambridge in 1903. The author's reputation as a physicist will naturally lead those who open these pages to expect a scholarly treatment of the subject, and they will not be disappointed; and although we are told in the preface that "this volume is in a sense my last will and testament on the subject of ventilation," we venture, after a careful perusal of the book, to express a hope that Dr. Shaw may find time to extend so judicious and original a treatment of this difficult branch of applied science.

Writers on the subject of ventilation are apt either to deal with individual schemes which have come under their notice, leaving useful general inferences to be constructed by the reader, or, armed with mathematics, to plunge *in medias res* among all the factors of the problem in a manner which entirely obscures the main issue. It is the more satisfactory, therefore, to find a book free from such shortcomings.

While admitting the many and complex problems which deserve consideration, the author of this volume brings us, by a wise process of selection and rejection, to issues which, while admittedly approximate to truth, are at the same time most valuable generalisations, and this with a mathematical restraint which should considerably increase the field in which the utility of his work will be felt.

The leading feature of the book is the development of the subject by the utilisation of an analogy between pneumatic and electrical flow and resistance, originated by Dr. Shaw some years ago. We are shown, for example, the relation of air flow to "head," or "aëromotive force," and how to deal with pneumatic resistances in parallel and multiple arc, and the analogy is even taken so far as the use of null methods in such determinations. In this spirit we are conducted through a network of difficulties in a manner which anyone with the most elementary knowledge of the laws of electricity will much appreciate. This analogy is not confined to mere theorising. Actual

apparatus consisting of thin plate orifices, large connecting boxes and delicately poised vanes, is figured and described by which the fundamental pneumatic laws may be demonstrated. For example, if H be the head or aëromotive force, R the resistance, or sum of resistances, and V the volume of air delivered, using comparable units, the relation $H=RV^2$, corresponding with Ohm's law $E=RC$, is shown to exist.

The book is divided into three chapters comprising respectively 26, 19, and 33 pages. The first deals with the laws of flow in air circuits and their verification, in the manner already referred to. The second with the physical principles applicable to the ventilated space, in which the important effects of changes of temperature and the convection currents resulting therefrom are discussed, and some sketches of delicate and simple apparatus used by the author in his investigations, together with some real and ideal thermal diagrams, are given. In the third chapter are discussed the essentials for practical ventilation, and, so far as the limits of the book permit, the various systems in general use. Here again the electrical analogy is given full play, and applied to the consideration of the open fire, the cowl, the vacuum and plenum systems, and to simple cross-ventilation.

The diction throughout the book is so clear and concise that we cannot even quarrel with Dr. Shaw when he refers to a draught along the floor as likely to set up "the reversed correlative of the therapeutic action" of putting one's feet in water, and we heartily endorse his suggestion that this important subject should receive more attention at the hands of those engaged in scientific research in our technical institutions.

OUR BOOK SHELF.

The Aim and Achievements of Scientific Method: an Epistemological Essay. By Dr. T. Percy Nunn. Pp. x. 144. (London: Macmillan and Co., Ltd., 1907.) Price 3s. 6d. net.

THIS essay is an expansion of a paper read before the Aristotelian Society in February, 1906, and was in its present form printed in September, 1906, and presented to the University of London as a thesis for the degree of Doctor of Science. The results described were reached in the course of a study of the problems of science teaching in schools, but its pedagogical applications are not considered in the present volume.

The essence of the doctrine presented by the author is the view that a large part of the contents of our consciousness from moment to moment consists of elements which exhibit themselves as having a certain unique "priority" to our conscious processes. These elements constitute what he describes as the objective. The aim of the scientific process is to render objective facts intelligible to an individual consciousness by building up the primary facts into "secondary constructions" by means of ideas drawn from other contexts of experience. No hypothesis is considered essentially incapable of making primary facts intelligible on the ground of the context of experience from which it is drawn, while the hypothesis is in no case to replace (in the sense of accounting for the "reality" of) the objective facts which it has been employed to render intelligible. The extent to which unification of the various provinces of scientific inquiry

can be brought about is identical with the range over which hypotheses drawn from a single context of experience can be applied to illustrate facts.

The author examines briefly the most systematic of the attempts that have been made to render the whole range of sensible facts intelligible by means of the concepts of "mass" and "motion," which are themselves drawn only from one province of primary facts. Huygens, in his discussion of the collision of elastic bodies, made use of what Mach calls an "instinctive perception," that the centre of gravity of a system left to itself cannot rise; this was by the Bernoullis developed into the principle of *vis viva*, upon which Helmholtz based his wider principle of the conservation of energy, which first brought the facts of heat into a line with those of mechanics. But though temperature changes are thus connected with mechanical facts, the doctrine does not effect a reduction of the former to the latter, nor is Lord Kelvin's absolute thermodynamic scale more successful, as it makes no attempt to deduce from dynamical data the experiences to which the notion of temperature refers. Even the theory of Helmholtz is only partially successful. The modern science of energetics expressly declines to attempt to explain one set of objective phenomena in terms of another, contenting itself with trying to bring physical facts into a form of unity without reducing them to one type. In doing so it exhibits a practice that accords with the philosophical tenets of Dr. Nunn's essay. The hypothesis has, as he shows, merely a transient function, to point the way to new facts, including relations between things, and should then efface itself.

The Principles and Practice of Brewing. By Dr. Walter J. Sykes. Third edition, revised by the author and Arthur R. Ling. Pp. xxviii+588; illustrated. (London: C. Griffin and Co., Ltd., 1907.) Price 21s. net.

THE publication of a new edition of this well-known book, which has been thoroughly revised by its author, the late Dr. Sykes, in conjunction with Mr. Ling, and brought well up to date, should be welcomed by all interested in the scientific aspect of the brewing industry. In one respect we think the late author and his colleague have lost an opportunity in not revising the original plan of the book, together with the matter it contains, for we have always considered that the book suffered to some extent in usefulness from the manner in which it was arranged; but, however this may be, the work in its present form stands easily first among books in our language devoted to a consideration of the complex scientific problems underlying the brewer's art.

The present edition, like the previous ones, is essentially a treatise on the scientific principles which underlie brewing technology, and although the word "practice" is included in its title, the space actually devoted to a description of the various processes of brewing and malting is comparatively small. In a book which deals in a somewhat encyclopædic manner with many different branches of science, naturally some unevenness is noticeable in the treatment of the various subjects included, but none of the more recent investigations of importance which bear on the subjects discussed appears to have been overlooked, and the references which are given add much to the value of the book. The strongest part of the book is undoubtedly the one which deals with the chemistry of the carbohydrates, more especially the chemistry of starch, and the author's *résumé* of the investigations which have been made in this country and abroad in connection with the transformation of starch by diastase is the most complete account of the subject